

WHAT IS CLAIMED IS:

1. A glass fiber product, comprising:
at least one glass fiber; and
particles adhered to the at least one glass fiber, wherein at least one parameter selected from the particle size and the amount of particles is effective to reduce the tackiness of the glass fiber product.
2. A glass fiber product according to claim 1, wherein the at least one glass fiber is at least partially coated with a coating, wherein the coating is a residue of a coating composition, wherein the coating composition is selected from a resin-compatible coating composition.
3. A glass fiber product according to claim 1, wherein the glass fiber product is chosen from a glass fiber strand, a glass fiber yarn, a glass fiber prepreg, and a glass fiber fabric.
4. A glass fiber prepreg comprising a glass fiber product according to claim 1.
5. A glass fiber product according to claim 1, wherein the particles have an average dimension ranging from 10 nm to 10 μm .
6. A glass fiber product according to claim 1, wherein the particles have an average dimension ranging from 10 nm to 5 μm .
7. A glass fiber product according to claim 1, wherein the particles have an average dimension ranging from 10 nm to 2 μm .
8. A glass fiber product according to claim 1, wherein the particles have an average dimension ranging from 10 nm to 0.6 μm .

9. A glass fiber product according to claim 1, wherein the particles have an average dimension ranging from 35 nm to 0.5 μm .

10. A glass fiber product according to claim 1, wherein the particles have an average dimension ranging from 50 nm to 0.4 μm .

11. A glass fiber product according to claim 1, wherein the particles have an average dimension ranging from 0.1 μm to 0.2 μm .

12. A glass fiber product according to claim 1, wherein the particles have an average dimension ranging from 25 nm to 50 nm.

13. A glass fiber product according to claim 1, wherein the particles have an average dimension ranging from 0.4 μm to 0.6 μm .

14. A glass fiber product according to claim 1, wherein the particles have a multimodal distribution of average dimensions.

15. A glass fiber product according to claim 14, wherein the particles have a bimodal distribution of average dimensions.

16. A glass fiber product according to claim 14, wherein the distribution of average particle dimensions comprises a first maximum in the range of from 10 nm to 0.1 μm and a second maximum in the range of from 0.1 μm to 10 μm .

17. A glass fiber product according to claim 14, wherein the distribution of average particle dimensions comprises a first maximum in the range of from 25 to 50 nm and a second maximum in the range of from 0.4 to 0.6 μm .

18. A glass fiber product according to claim 14, wherein the distribution of average particle dimensions comprises a first maximum and a second maximum both in the range of from 10 nm to 10 μm .

19. A glass fiber product according to claim 1, wherein the particles are selected from spherical particles, cubic ellipsoidal particles, and rectangular particles.

20. A glass fiber product according to claim 2, wherein the particles are present in an amount ranging from 0.5% to 60% by weight relative to a total weight of the coating.

21. A glass fiber product according to claim 2, wherein the particles are present in an amount ranging from 5% to 60% by weight relative to a total weight of the coating.

22. A glass fiber product according to claim 2, wherein the particles are present in an amount ranging from 0.5% to 25% by weight relative to a total weight of the coating.

23. A glass fiber product according to claim 2, wherein the particles comprise small particles having a dimension of not more than 0.1 μm , and wherein the small particles are present in an amount ranging from 0.5% to 25% by weight relative to a total weight of the coating.

24. A glass fiber product according to claim 1, wherein the particles are selected from inorganic particles, organic particles, and composite particles.

25. A glass fiber product according to claim 24, wherein the particles comprise inorganic particles selected from boron nitride, molybdenum disulfide, graphite, molybdenum diselenide, tantalum disulfide, tantalum diselenide, tungsten disulfide, tungsten diselenide, and mixtures thereof.

26. A glass fiber product according to claim 1, wherein the particles are selected from organic particles.

27. A glass fiber product according to claim 1, wherein the particles are selected from at least one of polyethylene, polymethylmethacrylates, polystyrenes, polyamides, aramids, thermoplastic polyesters, thermoplastic polyurethanes, polyethylene terephthalate, polybutylene terephthalate, acrylic polymers, polyacrylonitriles, polyolefins, polyurethanes, vinyl polymers, polyvinyl alcohol, polyesters, vinyl esters, epoxy materials, phenolics, aminoplasts, polycarbonates, polyolefins, and mixtures of any of the foregoing.

28. A glass fiber product according to claim 1, wherein the particles comprise polymeric organic particles.

29. A glass fiber product according to claim 1, wherein the particles comprise polyethylene particles.

30. A glass fiber product according to claim 1, wherein the particles are selected from hollow particles and solid particles.

31. A glass fiber product according to claim 1, wherein the particles comprise a mixture of organic particles and inorganic particles.

32. A glass fiber product according to claim 1, wherein the particles comprise first particles and second particles, wherein the first particles differ from the second particles in at least one parameter selected from size, shape, density, organic composition, inorganic composition, hydrophilicity, hydrophobicity, lipophilicity, lipophobicity, and crystallographic structure.

33. A glass fiber product according to claim 1, wherein the at least one parameter selected from particle size and amount of particles is effective to reduce the

tackiness of the glass fiber product without substantially increasing the tractive tension of the glass fiber product.

34. A glass fiber product according to claim '33, wherein the at least one parameter selected from particle size and amount of particles is effective to reduce the tackiness of the glass fiber product without increasing the tractive tension by more than 10% at at least one pressure ranging from 25 to 40 PSI.

35. A glass fiber product according to claim 1, wherein the at least one parameter selected from particle size and amount of particles is effective to reduce the frictional tension by at least 10%.

36. A glass fiber product according to claim 1, wherein the at least one parameter selected from particle size and amount of particles is effective to reduce the frictional tension by at least 25%.

37. A glass fiber product according to claim 1, wherein the at least one parameter selected from particle size and amount of particles is effective to reduce the frictional tension by at least 45%.

38. A glass fiber product according to claim 1, wherein the at least one parameter selected from particle size and amount of particles is effective to reduce the frictional tension by at least 50%.

39. A glass fiber product according to claim 1, wherein the at least one parameter selected from particle size and amount of particles is effective to reduce the frictional tension by at least 50 g.

40. A glass fiber product according to claim 1, wherein the at least one parameter selected from particle size and amount of particles is effective to reduce the frictional tension by at least 100 g.

41. A glass fiber product according to claim 1, wherein the at least one parameter selected from particle size and amount of particles is effective to at least one of (i) spatially separate the filaments and (ii) reduce a degree of interfilament bonding.

42. A glass fiber product according to claim 41, wherein a tractive tension of the fiber product is increased.

43. A glass fiber product according to claim 41, wherein a tractive tension of the fiber product is increased by at least 10 g at at least one pressure ranging from 30 to 40 psi.

44. A glass fiber product according to claim 41, wherein a tractive tension of the fiber product is increased by at least 20 g at at least one pressure ranging from 30 to 40 psi.

45. A glass fiber product according to claim 41, wherein a tractive tension of the fiber product is increased by at least 100% at at least one pressure ranging from 30 to 40 psi.

46. A glass fiber product according to claim 41, wherein a tractive tension of the fiber product is increased by at least 150% at at least one pressure ranging from 30 to 40 psi.

47. A glass fiber product according to claim 2, wherein the coating composition comprises at least 1% of dispersed particles relative to the total solids content of the coating composition.

48. A glass fiber product according to claim 2, wherein the coating composition comprises at least 2% of dispersed particles relative to the total solids content of the coating composition.

49. A glass fiber product according to claim 2, wherein the coating composition comprises at least 4% of dispersed particles relative to the total solids content of the coating composition.

50. A glass fiber product according to claim 2, wherein the coating composition comprises at least 5% of dispersed particles relative to the total solids content of the coating composition.

51. A glass fiber product according to claim 2, wherein the coating composition is at least one of a primary sizing, secondary sizing, tertiary sizing, and a slashing composition.

52. A glass fiber product according to claim 1, wherein the product comprises fibers selected from E-glass fibers, D-glass fibers, S-glass fibers, Q-glass fibers, E-glass derivative fibers, and mixtures of any of the foregoing.

53. A glass fiber coating composition, wherein the coating composition comprises dispersed particles having at least one parameter selected from particle size and amount of particle effective to reduce the tackiness of glass fibers coated with the coating composition; and solvent in an amount effective to give a total solids content in the range of 0.5 to 60 weight percent.

54. A glass fiber coating composition according to claim 53, wherein the total solids content is in the range of 1 to 30 weight percent.

55. A glass fiber coating composition according claim 53, wherein the particles have an average dimension ranging from 10 nm to 10 μm .

56. A glass fiber coating composition according claim 53, wherein the particles have an average dimension ranging from 10 nm to 0.6 μm .

57. A glass fiber coating composition according claim 53, wherein the particles are selected from inorganic particles, organic particles, and composite particles.

58. A coating composition according claim 53, wherein the particles comprise polymeric organic particles.

59. A coating composition according claim 53, wherein the particles are selected from hollow particles and solid particles.

60. A coating composition according claim 53, wherein the coating composition comprises less than 1% of lubricants chosen from water-soluble polymers, hydrocarbon oils, waxes, cationic lubricants, surfactants, and soaps.

61. A method for reducing the tackiness of a glass fiber product, comprising:
coating at least a portion of the glass fiber product with a coating composition, wherein the coating composition comprises dispersed particles having at least one parameter selected from particle size and amount of particles effective to reduce the tackiness of the glass fiber product; and solvent in an amount effective to give a total solids content ranging from 0.5 to 30 weight percent.

62. A method according to claim 61, wherein the particles have an average particle dimension ranging from 10 nm to 10 μm .

63. A method according to claim 61, wherein the particles have an average particle dimension ranging from 10 nm to 0.6 μm .

64. A method according to claim 61, further comprising impregnating the glass fiber product with at least one resin, wherein

the glass fiber product comprises at least two glass fibers, and

the coating composition comprises dispersed particles having at least one parameter selected from particle size and amount of particle effective to separate the at least two glass fibers sufficient to allow for resin impregnation between the at least two glass fibers; and solvent in an amount to give a total solids content in the range of 0.5 to 30 weight percent.

65. A method according to claim 64, comprising coating at least one of the glass fibers prior to forming the glass fiber product.

66. A method of reducing damage to glass fibers during at least one process chosen from forming, twisting, warping, weaving, roving, filament winding, texturizing, bulking, braiding, and knitting; wherein the method comprises conducting the at least one process using warp yarn comprising coated glass fibers, wherein

the coated glass fibers have a moisture-reduced residue of a sizing treatment on at least part of their surface, and

the coating composition comprises dispersed particles having at least one parameter selected from particle size and amount or particles effective to reduce the tackiness of the coated glass fiber; and solvent in an amount to give a total solids content in the range of around 1 to 30 weight percent.

67. A method according to claim 66, wherein the method comprises reducing the stripping back of broken fibers, and feeding the warp yarn from a wound source of fiber.

68. A method according to claim 66, wherein the warp yarn comprises fine yarn.

69. A method of reducing frictional drag on yarn as the yarn is pulled over at least one of packages and yarn guides, the method comprising using a yarn comprising coated glass fibers; and feeding the yarn across the at least one of packages and yarn guides, wherein

the coated glass fibers have a moisture-reduced residue of a sizing treatment on at least part of their surface, and

the coating composition comprises dispersed particles of a size and amount effective to reduce the tackiness of the coated glass fiber, and solvent in an amount to give a total solids content in the range of around 0.5 to 60 weight percent.

70. A method according to claim 69, wherein the yarn comprises fine yarn.

71. A method of increasing interfiber separation in a fiber texturizing process, comprising

texturizing coated glass fibers having a moisture-reduced residue of a sizing treatment on at least part of their surface,

wherein the coating composition comprises dispersed particles of a size and amount effective to increase the interfiber separation among the coated glass fibers, and solvent in an amount to give a total solids content in the range of around 0.5 to 60 weight percent.

72. A method of increasing fiber entanglement in a fiber bulking process, comprising

bulking coated glass fibers having a moisture-reduced residue of a sizing treatment on at least part of their surface,

wherein the coating composition comprises dispersed particles of a size and amount effective to increase the fiber entanglement among the coated glass fibers, and solvent in an amount to give a total solids content in the range of around 0.5 to 60 weight percent.